422231

FLOOD INSURANCE STUDY

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TOWNSHIP OF SPRINGFIELD, PENNSYLVANIA
YORK COUNTY

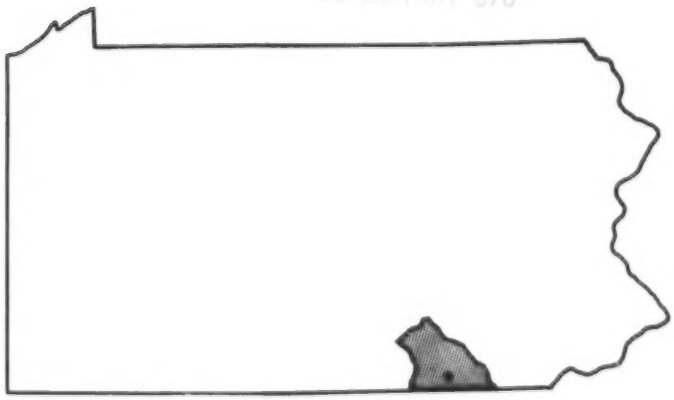

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgements	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	4
	2.4 Flood Protection Measures	4
3.0	ENGINEERING METHODS	5
	3.1 Hydrologic Analyses	5
	3.2 Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	7
	4.1 Flood Boundaries	7
	4.2 Floodways	8
5.0	INSURANCE APPLICATION	10
	5.1 Reach Determinations	10
	5.2 Flood Hazard Factors	11
	5.3 Flood Insurance Zones	11
	5.4 Flood Insurance Rate Map Description	13

TABLE OF CONTENTS - continued

	Page
6.0 OTHER STUDIES	13
7.0 LOCATION OF DATA	14
8.0 BIBLIOGRAPHY AND REFERENCES	14

FIGURES

Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	10

TABLES

Table 1 - Summary of Discharges	6
Table 2 - Floodway Data	9
Table 3 - Flood Insurance Zone Data	12

EXHIBITS

Exhibit 1 - Flood Profiles
East Branch Codorus Creek Panels 01P-02P

Exhibit 2 - Flood Boundary and Floodway Map Index

Exhibit 3 - Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
TOWNSHIP OF SPRINGFIELD, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Springfield, York County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Springfield to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by Erdman, Anthony, Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4765. This work was completed in September 1979.

1.3 Coordination

The initial Consultation and Coordination Officer's (CCO) meeting was held in April 1978 and was attended by representatives of the Township of Springfield, the FIA, and Erdman, Anthony, Associates, Inc. (the study contractor). A notice announcing the beginning of the study and stating its objective was placed in the local newspaper, York Daily Record, on October 19, 1978.

Contact for information relating to this study was made with the Township of Springfield engineer and the York County Planning Commission.

A final CCO meeting was held on April 10, 1980, to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Springfield, York County, Pennsylvania. Not included in this study are the Boroughs of Jacobus and Loganville. The area of study is shown on the Vicinity Map (Figure 1).

Floods caused by the overflow of East Branch Codorus Creek, from the confluence of Barshinger Creek (located in the adjacent Township of North Hopewell) to the Seaks Run Road bridge, were studied in detail. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through September 1984.

Flooding along Fishel Creek, Foust Creek, Seaks Run, South Branch Codorus Creek, Tributaries 1 and 2 to East Branch Codorus Creek and the remainder of East Branch Codorus Creek within the township limits was studied by approximate methods. Approximate methods of analysis were used to study those areas having low development potential and minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by the FIA.

2.2 Community Description

The Township of Springfield is located in the central portion of York County in south-central Pennsylvania. It is bordered to the north by the Township of York, to the east by the Township of North Hopewell, to the south by the Township of Shrewsberry and to the west by the Townships of Codorus and North Codorus and the Borough of Seven Valleys.

The township covers a total land area of 25.3 square miles and has a population of 2,221 (Reference 1). It is primarily rural with the majority of the land being agricultural or wooded. Development is very limited within the flood plains.

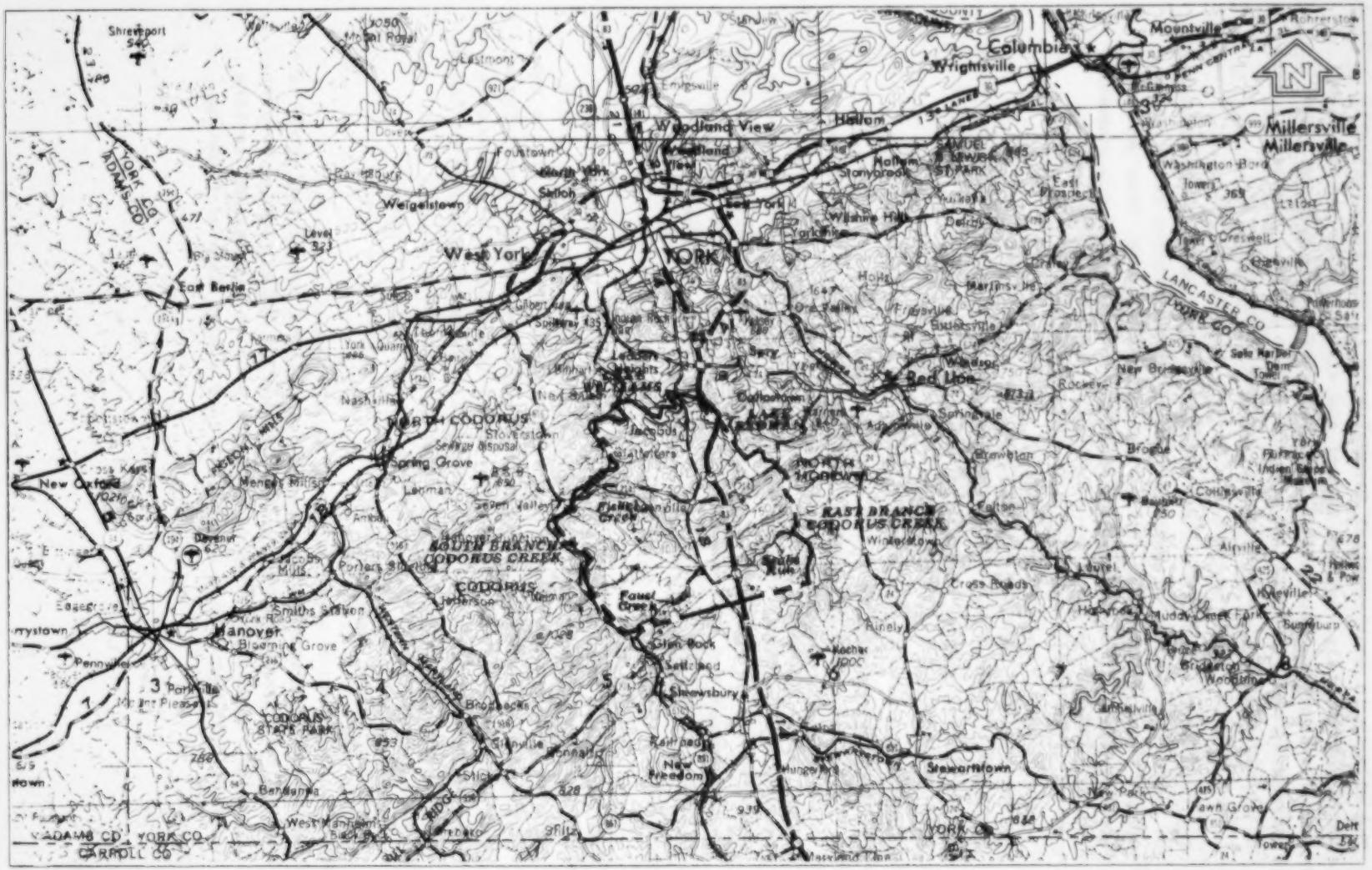


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF SPRINGFIELD, PA
(YORK CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

The climate in south-central Pennsylvania is characteristically humid continental. Average summer and winter temperatures range from 72.8 degrees Fahrenheit (°F) to 31.4°F, respectively. The average annual precipitation in this region is 39.2 inches which is uniformly distributed throughout the year (Reference 2).

The Codorus Creek basin encompasses all the streams in the Township of Springfield. Two principal tributaries of Codorus Creek, East Branch Codorus Creek and South Branch Codorus Creek, flow generally northward along the eastern and western boundaries of the township, respectively.

Located on East Branch Codorus Creek in the northern portion of the township are two York Water Company empoundments. These reservoirs are intended solely for municipal water supply and as such, have no reserve capacity allocated to flood control.

2.3 Principal Flood Problems

Major floods have occurred on the streams in Springfield during all seasons of the year. The past history of flooding indicates that the township is susceptible to flooding caused by hurricane activity in the summer and fall months. In the late winter and early spring, flooding has often been the result of snowmelt combined with rainfall.

The principal sources of flooding in the township are East Branch Codorus Creek and South Branch Codorus Creek. Since 1972, there have been two major floods on these streams. The worst of the two occurred in June 1972, as a result of Tropical Storm Agnes. Three years after Agnes, in September 1975, another major flood occurred during Tropical Storm Eloise. These floodwaters caused major damage to property, bridges and culverts in the township.

2.4 Flood Protection Measures

There are no existing or proposed local flood protection projects to reduce the flood hazards in the Township of Springfield. However, land use regulations adopted from the Code of Federal Regulations control building within areas that have a high risk of flooding.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one-percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten) and, for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

The discharges for East Branch Codorus Creek were determined from a regional flood-frequency procedure developed by the U. S. Army Corps of Engineers (COE) following Tropical Storm Agnes in June 1972. This procedure is based on a log-Pearson Type III analysis of discharge records for a large number of gaging stations in the Susquehanna River basin (Reference 3). The 500-year discharge for East Branch Codorus Creek was obtained by extending the discharge-frequency curve plotted for the stream.

For the streams studied by approximate methods, the 100-year discharge was obtained from the method developed by the Pennsylvania Department of Environmental Resources outlined in Water Resources Bulletin 13 (Reference 4).

A summary of drainage area-peak discharge relationships for East Branch Codorus Creek is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
EAST BRANCH CODORUS CREEK					
Downstream of Ore Road	25.3	2,765	5,185	6,580	10,300
Upstream of Barshinger Creek	19.8	2,335	4,430	5,645	9,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding source studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along this flooding source.

Cross sections for the backwater analyses of East Branch Codorus Creek were obtained from field survey. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Channel roughness factors (Manning's "n") used in the hydraulic computations were evaluated from photographs and field observations of the stream and its flood plain. The "n" values were selected from tables published by Ven Te Chow based on channel conditions and overbank vegetation or land use (Reference 5). Roughness values for the main channel of East Branch Codorus Creek ranged from 0.033 to 0.045 and the flood plain roughness values ranged from 0.033 to 0.07.

Water-surface elevations of the 10-, 50-, 100-, and 500-year floods were computed using the COE HEC-2 step-backwater computer program (Reference 6). Starting water-surface elevations for East Branch Codorus Creek were calculated using the slope/area method.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 3).

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 enlarged from 1:24,000 with a contour interval of 20 feet (Reference 7). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundary of the 100-year flood was developed from normal depth calculations and the topographic maps referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 3). Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this report is presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plains. At cross sections where, due to the physical characteristics of the stream channel, the method of equal conveyance reduction was inappropriate, the floodway was set by a method of conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown. A portion of the floodway of East Branch Codorus Creek lies outside of the corporate limits.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
East Branch Codorus Creek								
A	5,200	274	1,016	6.5	518.0	518.0	519.0	1.0
B	5,830	83	538	10.5	520.3	520.3	520.8	0.5
C	6,805	154	784	7.2	525.1	525.1	525.5	0.4
D	7,780	84	815	6.9	531.0	531.0	531.2	0.2
E	8,575	152	1,103	5.1	532.0	532.0	532.5	0.5
F	9,735	109	637	8.9	533.0	533.0	534.0	1.0
G	10,720	184	972	5.8	537.0	537.0	537.9	0.9
H	11,910	163	635	8.9	541.8	541.8	542.3	0.5
I	12,800	198	789	7.2	548.5	548.5	548.5	0.0
J	13,835	119	626	9.0	549.8	549.8	550.6	0.8
K	14,920	191	809	7.0	555.0	555.0	555.8	0.8
L	15,950	120	1,006	5.6	563.8	563.8	564.7	0.9

[1] Feet above Stone Hill Road
[2] This width extends beyond corporate limits

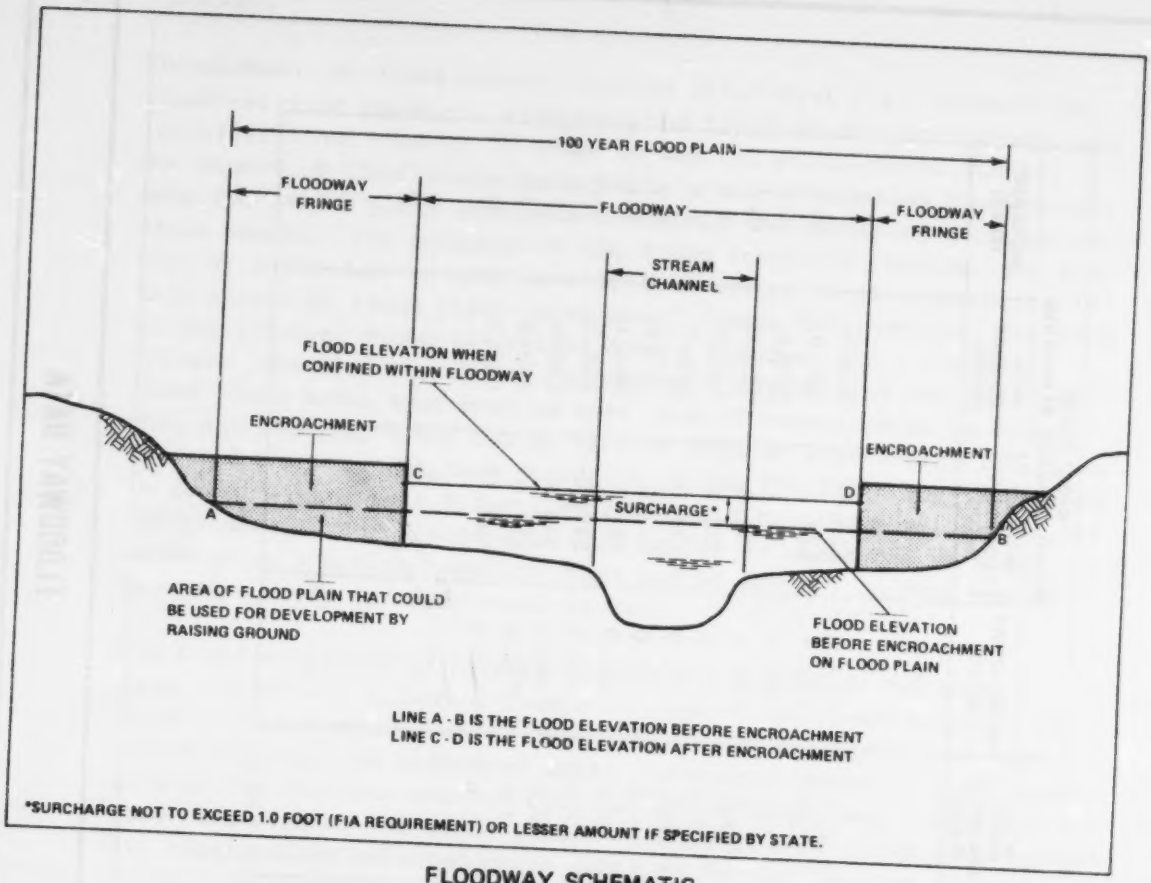
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF SPRINGFIELD, PA
(YORK CO.)

FLOODWAY DATA

EAST BRANCH CODORUS CREEK


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE*
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for the flooding source affecting the Township of Springfield.

5.1 Reach Determination

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding source of the Township of Springfield are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Township of Springfield was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.

Zone A4: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
East Branch Codorus Creek Reach 1	015	-2.0	-0.8	+1.3	020	A4	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF SPRINGFIELD, PA
(YORK CO.)

FLOOD INSURANCE ZONE DATA

EAST BRANCH CODORUS CREEK

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding source studied in detail in the Township of Springfield.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Township of Springfield is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Insurance Study is currently being conducted for the adjacent community of the Township of North Hopewell (Reference 8). The results of that study will be in exact agreement with the results of this study. No other studies were found to exist at the time of this report.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region III Office, Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Number of Inhabitants, Pennsylvania, Washington, D. C., U. S. Government Printing Office, 1971.

2. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, Monthly Averages of Temperature and Precipitation for Pennsylvania Climatic Divisions, 1941-1970, Asheville, North Carolina, 1971.

3. U. S. Army Corps of Engineers, New York District, Hydrologic Study, Tropical Storm Agnes, New York, December 1975.

4. Commonwealth of Pennsylvania, Department of Environmental Resources, in cooperation with the U. S. Geological Survey, Water Resources Bulletin No. 13, Floods in Pennsylvania, A Manual for Estimation of their Magnitude and Frequency by Herbert J. Flippo, Jr., Harrisburg, Pennsylvania, October 1977.

5. Ven Te Chow, Open-Channel Hydraulics, New York, McGraw-Hill, 1959.

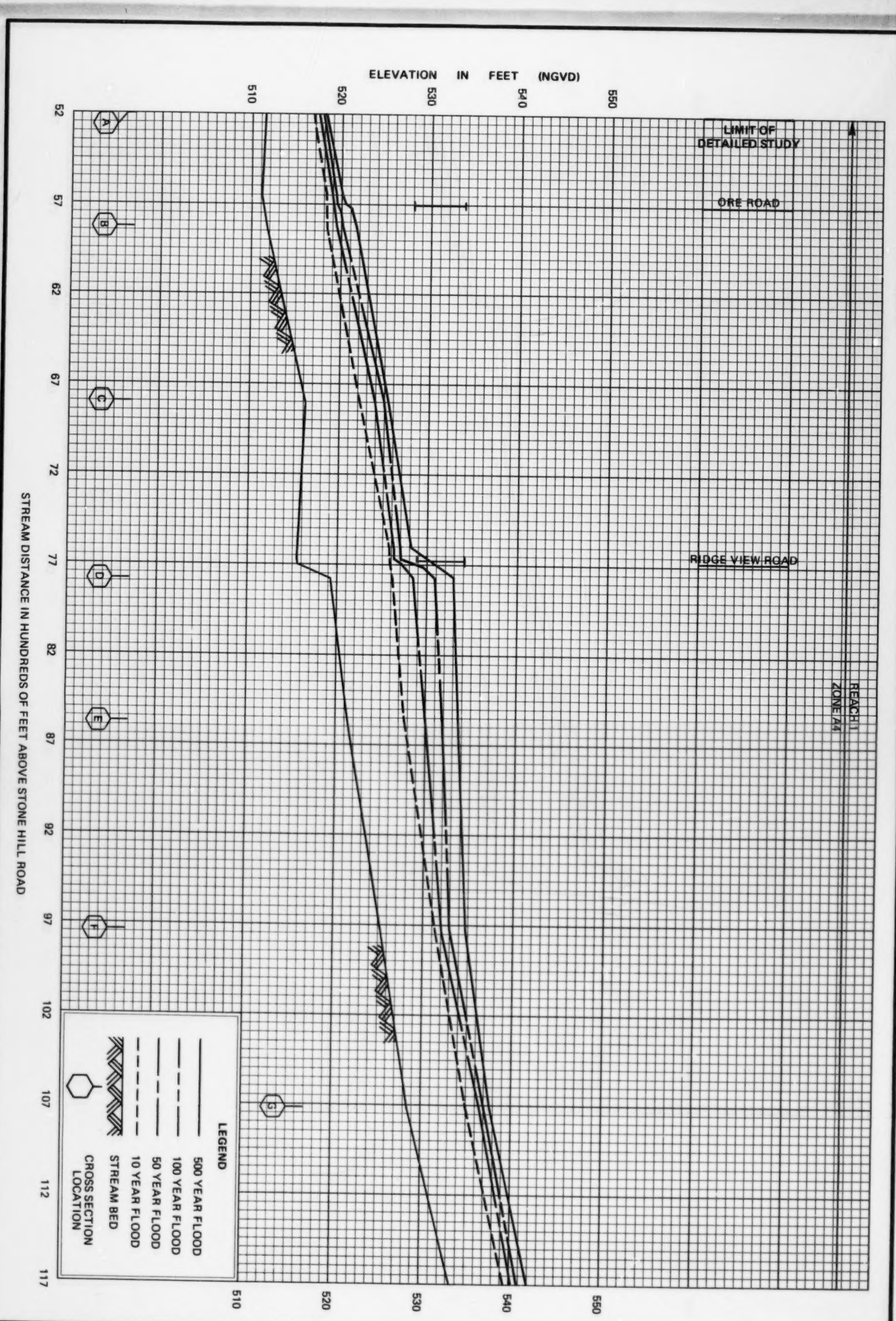
6. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, November 1976.

7. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Glen Rock, Pennsylvania, 1973; Seven Valleys, Pennsylvania, 1973; West York, Pennsylvania, 1973; York, Pennsylvania, 1973.

8. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Township of North Hopewell, York County, Pennsylvania (Unpublished).

Commonwealth of Pennsylvania, Department of Environmental Resources, Pennsylvania Gazetteer of Streams, Part 1 by L. C. Shaw and W. F. Busch, Harrisburg, Pennsylvania, 1971.

York County Planning Commission, Flood Plains, A Topical Study on York County, York, Pennsylvania, June 1974.



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FEDERAL EMERGENCY MANAGEMENT AGENCY
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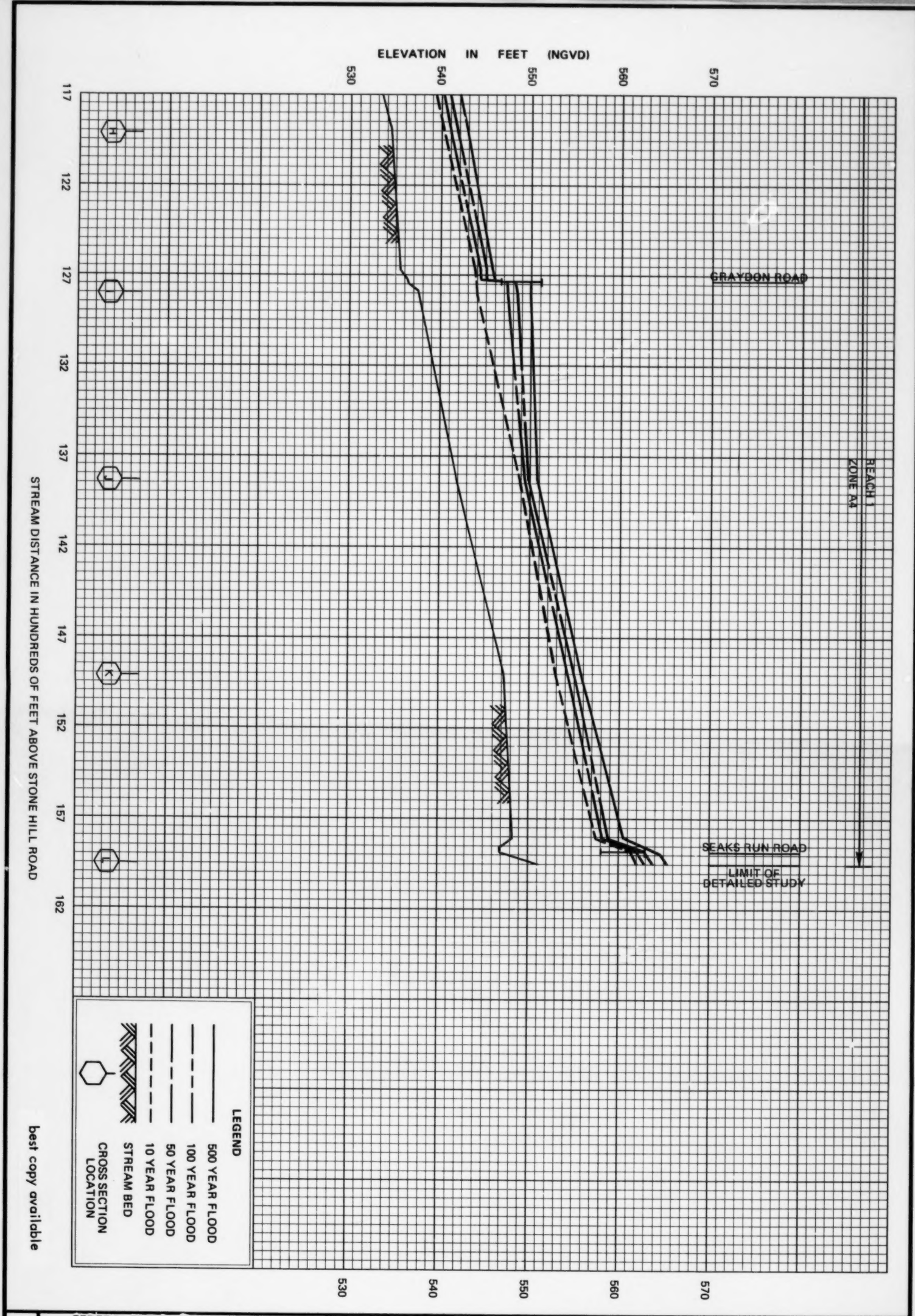
TOWNSHIP OF SPRINGFIELD, PA
(YORK CO.)

FLOOD PROFILES

EAST BRANCH CODORUS CREEK



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FLOOD PROFILES

EAST BRANCH CODORUS CREEK